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Description

The present invention relates to apparatus for producing dough pieces, and more particularly, high volume apparatus for producing dough pieces cut from extruded dough according to the preamble of claim 1.

US—A—4 332 538 describes a dough piece production apparatus in which a single stream of dough is fed from a hopper by means of a pair of intermeshing screws through metering device and then through a dispensing nozzle, the stream of dough being cut into a series of dough pieces at the nozzle by a reciprocating paddle.

US—A—2 838 013 describes a dough piece production apparatus in which a dough feeding assembly feeds dough from a hopper through a nozzle, and the resulting extruded rope of dough is cut into sections (dough pieces) by an oscillating cutter. This cutter undergoes a complex reciprocating motion involving movements parallel to the direction of extrusion of the dough, as well as cutting movements perpendicular to the direction of extrusion of the dough.

In the types of apparatus described in the two aforementioned patents, the cut dough pieces fall onto a conveyor disposed below the nozzle. To secure increased production rates, the apparatus may include a plurality of nozzles spaced from one another across the width of the conveyor, each nozzle depositing a separate stream of dough pieces onto the conveyor.

In the baking industry, there are continuous technological efforts to increase the rate of product flow through the dough forming, baking and packaging operations of the manufacturing process.

When dough pieces for certain baked products are formed by the wire cut method, in which dough is extruded from a horizontally oriented die and sections of the dough are sliced off by a thin moving wire (as in the two aforementioned patents), it has been found that the speed of the baking and packaging operations have advanced to the point where the commercially available wire cut machines cannot supply dough pieces at a rate sufficient to match that of the baking and packaging operations. While the extrusion rate can be increased considerably without difficulty, there is a practical limit to the speed at which the cutting wire will efficiently form dough pieces.

A wire cut machine, such as those described in the two aforementioned patents, deposits dough pieces on to a conveyor belt in parallel rows or columns. The normal speed of operation of these machines is between 150 and 180 pieces per minute for each line deposited on the conveyor. At these speeds, the wire cuts cleanly through the extruding dough without transferring a significant amount of energy to the piece cut off. The pieces fall vertically onto the conveyor in a consistent uniform pattern. When these machines run at speeds greater than 180 pieces per minute, the pattern is disrupted in two ways. At these high speeds the machine begins to vibrate

and this effects the placement of the dough pieces. Also, the wire, because of its speed, transfers sufficient energy into the pieces to throw the pieces horizontally in an unpredictable manner. In addition, when the dough contains particles such as chocolate chips, the energy transferred to the pieces varies according to the number and location of the particles which are struck by the wire as it passes through the extrusion.

As a result of this unpredictable horizontal displacement of the dough pieces, the dough pieces are deposited on the conveyor in an irregular pattern which effects the baking and packaging operations. Modern efficient automated packaging machinery requires that the baked articles be arranged in well defined rows. Also, wire cut dough pieces generally spread during baking. Therefore, dough pieces which are too close together fuse into one large irregular baked piece and must be discarded. Modern packaging methods also require that the dough pieces be uniform in size so as to produce baked products of uniform size and weight which can be processed by automatic machinery.

It is therefore an object of the present invention to provide apparatus for producing dough pieces in high volume.

Another object is to provide such apparatus for producing wire cut dough pieces arranged in well defined rows.

Another object is to provide extrusion apparatus containing simple and effective means for balancing the flow of dough from a plurality of nozzles fed by a common source.

The foregoing objects are accomplished by providing a conveyor and a dough piece former having plural outlets spaced along the direction of travel of the conveyor, the speed of the conveyor being related to the operating speed of the dough piece former so as to form a line of evenly spaced dough pieces; and by providing throttling apparatus for balancing the flow of dough from a common source to individual nozzles according to the characterising part of claim 1.

A preferred embodiment of the invention have been chosen for purpose of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Fig. 1 is a side elevational view of a wire cut, dough piece forming apparatus according to the present invention,

Fig. 2 is a plan view taken generally along line 2—2 on Fig. 1,

Fig. 3 is an enlarged view of a portion of Fig. 2 showing flow adjusting mechanisms,

Fig. 4 is a sectional view taken along line 4—4 on Fig. 3,

Fig. 5 is an end view of the arrangement shown on Fig. 3,

Fig. 6 is a side view of a flow adjusting rod,

Fig. 7 is a front view of an auger positioning spacer, and

Fig. 8 is a plan view of a portion of the

conveyor illustrating the drop sequence of dough pieces in forming a row of dough pieces.

Referring to the drawings in detail, there is shown apparatus according to the present invention which includes a conveyor 10 having a belt 11, and a wire cut dough machine 12 positioned over the conveyor. The machine 12 incorporates a series of dual extruders 14 spaced across the conveyor 10, each having two extrusion nozzles 15, 16. The extruders 14 are fed from a common hopper 17 by two feed rolls 18, 19. The hopper 17 and the rolls 18, 19 extend transversely of the conveyor across the extruders. A wire cut mechanism 20 simultaneously slices through the dough extruding from the nozzles 15, 16 to form dough pieces which fall upon the conveyor belt.

Referring now to Fig. 4, dough is forced by the rolls 18, 19 between a pair of scrapers 21 into the inlets 22 of the extruders. Each of the extruders 14 comprises a dual auger 24 fitted into a bore 25 in an auger housing 26. The nozzles 15, 16 are fastened to the bottom of the housing 26 in line with discharge openings 27, 28 at opposite ends of the dual auger.

The dual auger 24 comprises a right hand thread section 29 and a left hand thread section 30 which meet at the center beneath the inlet opening 22.

At the discharge ends of the augers, the minor diameter (the diameter of the central body) is increased to develop a greater dough pressure at the nozzles.

The shafts 32 on which the augers are formed are journaled at one end in a bearing block 34 and extend in the opposite direction through a block 35 which supports the drive motor 36 and gear train 37 which power the augers. The gear train includes a drive gear 39 mounted on the end of each shaft 32 and intermeshed with the adjacent gears 39. Since the gear train drives adjacent shafts in opposite directions, the augers formed on adjacent shafts are pitched oppositely. The shafts 32 are locked against axial movement with respect to the block 35 by suitable thrust bearings.

The support block 35 is mounted on a pair of shafts 40 which extend through the block 35 and into a bore 41 in the auger housing 26, as shown in Fig. 2. A rod 42, threaded at both ends, extends through the auger housing and is screwed into the end of the shaft 40 in the bore 41. A nut 44 is provided on the free end of the rod 42 to position the support block 35, and thereby the augers 24, relative to the auger housing 26. The position of the augers 24 with respect to the inlets 22 effects the relative rate of dough flow to the left hand and right hand portions of the auger.

The free end of each shaft 40 rests, for support, on the edge of a vertical plate 45, as shown in Fig. 1. A tube 46, provided with a slot in the bottom to admit the plate 45, surrounds the free end of each shaft 40.

Each tube 46 is provided with a cap 47 on its free end and a flange 49 on the end adjacent the block 35. A bolt 50 extending through the cap 47 is threaded into the end of the shaft 40 to urge the

sleeve to the right (as seen in Fig. 1) and position the flange 49 against the block 35.

Referring to Fig. 2, a spacer 51 is positioned between the block 35 and the auger housing 26. The spacers, shown in plan view in Fig. 7, are provided with counter-sunk bolt holes 52 and are bolted to the housing 26. The thickness of the spacer needed is determined by trial and error using thin shims where the spacer is. The machine 12 is placed in operation and the spacing between the block 35 and the housing 26 is adjusted by the adding and removing of shims until the flow rate from the nozzles 15 and the nozzles 16 are equal. Spacers of the required thickness are then substituted for the shims.

In a conventional bakery setup, the wire cut dough machine could contain 18 or more augers spaced across the conveyor belt. The augers and bores are formed by machining, and, even with strict tolerances, some variations from part to part are unavoidable. Also, the flow rate from hopper to the inlet openings tend to decrease at the ends of the hopper where friction with the end walls of the hopper produces a degree of laminar flow. The effects of these factors would result in variations in the size of the dough pieces in some rows with respect to that in others. Therefore, individually adjustable throttling mechanisms are provided at each inlet 22 to balance the output of the extruders 14.

As shown in Figs. 3 and 4, a choke rod 54 extends through the auger housing 26 to intersect the edge of each opening 22. The rods 54 are cut out to provide a curved surface 55 which matches the contour of the edge of the inlet 22. When the surface 55 is vertically oriented, the inlet is unrestricted allowing full flow into the dual extruder. As the rod 54 is rotated through 90 degrees, the restriction provided by the rod increases to a maximum. Each rod 54 is rotationally positioned by means of an adjustment plate 56. A square formation 57 is provided on the free end of the rod. The plate 56 has a matching square hole (not shown). The plate is mounted on the formation 57 and held by a bolt 58.

Referring also to Fig. 5, the shape of the adjustment plate 56 approximates a circular quadrant. A curved slot 59 is formed in the plate along a 90 degree circular arc having its center at the axis of the rod 54. Each adjustment plate 56 is locked in position by a bolt 60 which extends through the curved slot, into the edge of a block 61 mounted on the auger housing 26.

The wire cut mechanism 20 includes a guide rod 62 mounted on each end of the machine 12 by a bracket 64. Sliding blocks 65 and 66 are mounted on each of the rods 62 on either side of the support bracket 64. Wire holding fingers 67, 68 are mounted on pivoted rods (not shown) which extend between the blocks 65, 66. Wires are stretched across the conveyor belt 11 between the free ends of the fingers 67 and between the free ends of the fingers 68. The sliding blocks 65 and 66 on each side of the machine are interconnected by bars 69 for synchronous motion.

The sliding blocks are reciprocated upon the guide rods by a crank mechanism 70 driven by a motor 71. The reciprocating motion of the blocks 65, 66 move the cutting wires past the nozzles. Another crank mechanism (not shown) also driven by the motor 71 pivots the wire holding fingers 67, 68 upwardly toward the nozzles at the beginning of the cut stroke so that the wires move across the faces of the nozzles as the extrusion is sliced. On the retract stroke, the wire holding fingers are pivoted downwardly so that the wires pass below the end of the extruding dough streams.

The conveyor 10 is driven by a motor 72 provided with a speed control unit 74. The speed of the conveyor is adjusted with relation to the speed of operation of the cut-off mechanism 20, so that, between dough piece drops, the conveyor belt 11 moves a distance equal to two thirds of the spacing of the nozzles 15 and 16. Referring to Fig 8, there is shown the drop pattern for one set of nozzles 15, 16. The nozzles are positioned above the circles marked "Drop Point" and are separated by a distance X as indicated. The circles on the conveyor belt 11 represent the dough pieces formed on four consecutive drops. The position of these dough pieces is that which they occupy at the time the fourth drop is made. The dough pieces marked "1" were dropped on the first drop and have moved through a distance of three times $2/3X$. The dough pieces marked "2" were dropped on the second drop and have moved through a distance of two times $2/3X$. The dough pieces marked "3" were dropped on third drop and have moved the distance $2/3X$.

Of these pieces, the "A" pieces were dropped from a nozzle 15 and the "B" pieces were dropped from a nozzle 16. The "A" pieces are separated from each other by a distance of $2/3X$. The "B" pieces are likewise separated from each other by a distance of $2/3X$, and each "B" piece falls halfway between two consecutive "A" pieces. Thus a line of dough pieces are formed in which the consecutive pieces are separated by one third the distance between the nozzles.

It will be seen from the foregoing that the present invention provides apparatus for producing dough pieces in high volume which are arranged in well defined rows and are of uniform size and weight.

Claims

1. A dough piece production apparatus comprising a continuously movable conveyor (10, 11), an extrusion mechanism (14) having a plurality of extrusion nozzles (15, 16) disposed above the conveyor (10, 11), a dough feeding assembly (17, 18, 19) arranged to feed dough through the nozzles (15, 16) and a cutter (20) arranged to cut off sections of dough extruding from the nozzles (15, 16) to form dough pieces, characterized in that a plurality of extrusion nozzles (15, 16) are spaced from one another longitudinally along the conveyor (10, 11) and a drive assembly (72, 74) is

provided for driving the conveyor (10, 11) at a speed related to the spacing of the nozzles (15, 16) and the rate of formation of dough pieces so that a line of equally spaced dough pieces is formed on the conveyor (10, 11).

2. An apparatus according to Claim 1 characterized in that the extrusion mechanism (14) comprises a pair of nozzles (15, 16), the cutting assembly (20) simultaneously cuts dough pieces at the pair of nozzles (15, 16), and the conveyor (10, 11) is driven at a speed such that successive dough pieces formed at each nozzle (15, 16) are spaced from one another along the conveyor (10, 11) by a distance equal to two-thirds of the distance between the nozzles of the pair of nozzles (15, 16).

3. An apparatus according to Claim 2 characterized in that the dough feeding assembly (17, 18, 19) comprises a pair of threaded extruders each of which comprises an auger (24) disposed in a bore (25).

4. An apparatus according to Claim 3 characterized in that the two augers (24) are driven by a common drive mechanism.

5. An apparatus according to Claim 3 or 4, characterized in that the extruders (14) are fed with dough from a common inlet (22).

6. An apparatus according to Claim 5 characterized in that the augers (24) are connected to one another end to end adjacent the inlet (22) and the threads (29, 30) of the augers (24) are of opposite pitch.

7. An apparatus according to Claim 5 or 6 characterized in that the augers (24) are movable axially relative to the inlet (22) to balance the relative output of the two augers (24).

8. An apparatus according to any one of Claims 5, 6 and 7 characterized by a plurality of dual extrusion mechanisms (14) spaced across the conveyor (10, 11), each of these extrusion mechanisms (14) having a separate inlet (22), the apparatus further comprising a common dough hopper (17) disposed above all the inlets (22), feed rolls (18, 19) extending transversely across the conveyor (10, 11) and arranged to feed dough from the hopper (17) into the inlets (22), and a flow adjusting mechanism (54—61) capable of adjusting the relative rates of flow of dough through the inlets (22).

9. An apparatus according to Claim 8 wherein the adjusting device comprises a movable member (54) disposed in each of the inlets (22), this movable member (54) producing a flow restriction of the inlet (22) which varies with the position of the movable member (54).

10. An apparatus according to Claim 9 characterized in that each of the movable members (54) comprises a rod intersecting its associated inlet (22) and a pivoting device (56, 58, 59, 60) arranged to hold the rod in a plurality of differing rotational positions, the rod (54) having a cut-out section (55) which produces a flow restriction of the inlet (22) in at least one rotation position of the rod (54).

11. An apparatus according to Claim 10 characterized in that the rod (54) intersects the periphery

of the inlet (22) and the cut-out section (55) of the rod (54) has a form such that, in one rotational position of the rod (54), the cut-out section (55) matches the shape of the inlet (22), thereby substantially eliminating flow restriction of the inlet (22) in this rotational position of the rod.

Patentansprüche

1. Maschine zum Herstellen von Teigstücken mit einem kontinuierlich laufenden Förderer (10, 11), einer Strangpreßvorrichtung (14) mit einer Mehrzahl von über dem Förderer (10, 11) angeordneten Strangpreßdüsen (15, 16), mit einer Teigzuführungseinrichtung (17, 18, 19) für die Zufuhr von Teig bis zu den Düsen (15, 16) und einer Schneidvorrichtung (20) zum Abschneiden von Teilen vom aus den Düsen (15, 16) ausgepreßten Teig zur Bildung von Teigstücken, dadurch gekennzeichnet, daß eine Mehrzahl von Strangpreßdüsen (15, 16) mit Abständen voneinander in Längsrichtung des Förderers (10, 11) an ihm entlang angeordnet sind und daß ein Antriebsaggregat (72, 74) für den Antrieb des Förderers (10, 11) mit einer Geschwindigkeit vorgesehen ist, die in Beziehung steht zum Abstand der Düsen (15, 16) und der Geschwindigkeit der Erzeugung von Teigstücken, so daß eine Reihe von mit gleichen Abständen auf dem Förderer (10, 11) angeordneten Teigstücken gebildet wird.

2. Maschine nach Anspruch 1, dadurch gekennzeichnet, daß die Strangpreßvorrichtung (14) ein Paar von Düsen (15, 16) enthält, daß die Schneidvorrichtung (20) Teigstücke an dem Paar der Düsen (15, 16) gleichzeitig abschneidet und daß der Förderer (10, 11) mit einer solchen Geschwindigkeit angetrieben wird, daß aufeinanderfolgende Teigstücke, die an jeder Düse (15, 16) entstehen, entlang dem Förderer (10, 11) einen Abstand aufweisen, der gleich zwei Dritteln des Abstandes zwischen dem Paar der Düsen (15, 16) ist.

3. Maschine nach Anspruch 2, dadurch gekennzeichnet, daß die Teigzuführungseinrichtung (17, 18, 19) ein Paar von Schnecken-Strangpressen aufweist, von denen jede eine in einer Bohrung (25) angeordnete Schnecke (24) enthält.

4. Maschine nach Anspruch 3, dadurch gekennzeichnet, daß die beiden Schnecken (24) von einem gemeinsamen Antriebsmechanismus angetrieben werden.

5. Maschine nach Anspruch 3 oder 4, dadurch gekennzeichnet, daß die Strangpressen (14) von einer gemeinsamen Einlaßöffnung (22) mit Teig beschickt werden.

6. Maschine nach Anspruch 5, dadurch gekennzeichnet, daß die Schnecken (24) an dem an der Einlaßöffnung (22) angrenzenden Ende miteinander verbunden sind und die Gewinde (29, 30) der Schnecken (24) entgegengesetzt gerichtete Steigungen aufweisen.

7. Maschine nach Anspruch 5 oder 6, dadurch

gekennzeichnet, daß die Schnecken (24) axial und relativ zur Einlaßöffnung (22) verschiebbar sind, um die relative Ausbeute der beiden Schnecken auszugleichen.

8. Maschine nach einem der Ansprüche 5, 6 und 7, gekennzeichnet durch eine Mehrzahl von zweifachen Strangpreßvorrichtungen (14), die über dem Förderer (10, 11) mit Abständen angeordnet sind, wobei jede dieser Strangpreßvorrichtungen (14) eine besondere Einlaßöffnung (22) aufweist, wobei die Maschine außerdem einen gemeinsamen Teigtrichter (17) enthält, der über allen Einlaßöffnungen (22) vorgesehen ist, sich Zuführungswalzen (18, 19) quer über dem Förderer (10, 11) erstrecken, die so angeordnet sind, daß sie den Teig vom Trichter (17) den Einlaßöffnungen (22) zuführen, und durch eine Zufluß-Einstellvorrichtung (54—61), welche die relativen Zuflußraten des Teiges durch die Einlaßöffnungen (22) einzustellen imstande ist.

9. Maschine nach Anspruch 8, dadurch gekennzeichnet, daß die Einstellvorrichtung ein in jedem der Einlaßöffnungen (22) angeordnetes verstellbares Glied (54) enthält, wobei dieses Glied (54) eine Drosselung des Zuflusses der Einlaßöffnung (22) hervorruft, die sich mit der Stellung des verstellbaren Gliedes (54) ändert.

10. Maschine nach Anspruch 9, dadurch gekennzeichnet, daß jedes der verstellbaren Glieder (54) aus einer Stange besteht, die sich mit der ihr zugeordneten Einlaßöffnung (22) schneidet, und daß eine Schwenkeinrichtung (56, 58, 59, 60) so eingerichtet ist, daß sie die Stange (54) in einer Mehrzahl von verschiedenen Drehstellungen fixiert, wobei die Stange (54) eine Aussparung (55) aufweist, die eine Zuflußdrosselung der Einlaßöffnung (22) in wenigstens einer Drehstellung der Stange (54) hervorruft.

11. Maschine nach Anspruch 10, dadurch gekennzeichnet, daß die Stange (54) die Peripherie der Einlaßöffnung (22) schneidet und die Aussparung (55) der Stange (54) eine derartige Form besitzt, daß sich die Aussparung (55) in einer Drehstellung der Stange (54) der Linienführung der Einlaßöffnung (22) anpaßt, wodurch eine Zuflußdrosselung der Einlaßöffnung (22) in dieser Drehstellung der Stange im wesentlichen vermieden wird.

Revendications

1. Appareil pour la production de morceaux de pâte, comprenant un transporteur mobile de façon continue (10, 11), un mécanisme d'extrusion (14) ayant une pluralité de buses d'extrusion (15, 16) disposées au-dessus du transporteur (10, 11), un dispositif d'alimentation de pâte (17, 18, 19) agencé pour fournir de la pâte à travers les buses (15, 16) et un couteau (20) agencé pour découper des sections de pâte extrudée des buses (15, 16) pour former des morceaux de pâte, caractérisé en ce qu'une pluralité de buses d'extrusion (15, 16) sont espacées l'une de l'autre longitudinalement le long

du transporteur (10, 11) et un ensemble d'entraînement (72, 74) est prévu pour entraîner le transporteur (10, 11) à une vitesse dépendant de l'espacement des buses (15, 16) et de la vitesse de formation des morceaux de pâte de sorte qu'une ligne de morceaux de pâte équidistants est formée sur le transporteur (10, 11).

2. Appareil selon la revendication 1, caractérisé en ce que le mécanisme d'extrusion (14) comprend une paire de buses (15, 16), l'ensemble de coupe (20) découpe simultanément des morceaux de pâte au niveau de la paire de buses (15, 16), et le transporteur (10, 11) est entraîné à une vitesse telle que des morceaux de pâte successifs formés à chaque buse (15, 16) sont espacés l'un de l'autre le long du transporteur (10, 11) d'une distance égale aux deux tiers de la distance entre les buses de la paire de buses (15, 16).

3. Appareil selon la revendication 2, caractérisé en ce que l'ensemble d'alimentation de pâte (17, 18, 19) comprend une paire d'extrudeuses, chacune desquelles comprend une hélice (24) disposée dans un alésage (25).

4. Appareil selon la revendication 3, caractérisé en ce que les deux hélices (24) sont entraînées par un mécanisme d'entraînement commun.

5. Appareil selon la revendication 3 ou 4, caractérisé en ce que les extrudeuses (14) sont alimentées par de la pâte à partir d'une entrée commune (22).

6. Appareil selon la revendication 5, caractérisé en ce que les hélices (24) sont reliées l'une à l'autre bout à bout de façon adjacente à l'entrée (22) et en ce que les filets (29, 30) des hélices (24) sont de pas opposés.

7. Appareil selon la revendication 5 ou 6, caractérisé en ce que les hélices (24) sont axialement mobiles par rapport à l'entrée (22) pour équilibrer les débits relatifs des deux hélices (24).

8. Appareil selon l'une quelconque des revendications 5, 6 et 7, caractérisé par une pluralité de mécanismes d'extrusion doubles (14) espacés à travers le transporteur (10, 11), chacun de ces mécanismes d'extrusion (14) ayant une entrée séparée (22), l'appareil comprenant de plus une trémie de pâte commune (17) disposée au-dessus de toutes les entrées (22), des galets d'alimentation (18, 19) s'étendant transversalement à travers le transporteur (10, 11) et agencés pour amener la pâte à partir de la trémie (17) dans les entrées (22), et un mécanisme de réglage de débit (54—61) pouvant régler les débits relatifs de pâte à travers les entrées (22).

9. Appareil selon la revendication 8, caractérisé en ce que le dispositif de réglage comprend un organe mobile (54) disposé dans chacune des entrées (22), cet organe mobile (54) produisant un étranglement de flux de l'entrée (22) qui varie avec la position de l'organe mobile (54).

10. Appareil selon la revendication 9, caractérisé en ce que chacun des organes mobiles (54) comprend une tige coupant son entrée associée (22) et un dispositif pivotant (56, 58, 59, 60) agencé pour maintenir la tige dans une pluralité de positions de rotation différentes, la tige (54) ayant une section découpée (55) qui produit un étranglement de flux de l'entrée (22) dans au moins une position de rotation de la tige (54).

11. Appareil selon la revendication 10, caractérisé en ce que la tige (54) coupe la périphérie de l'entrée (22) et la section découpée (55) de la tige (54) présente une forme telle que, dans une position de rotation de la tige (54), la section découpée (55) correspond à la forme de l'entrée (22), en éliminant ainsi sensiblement l'étranglement de flux de l'entrée (22) dans cette position de rotation de la tige.

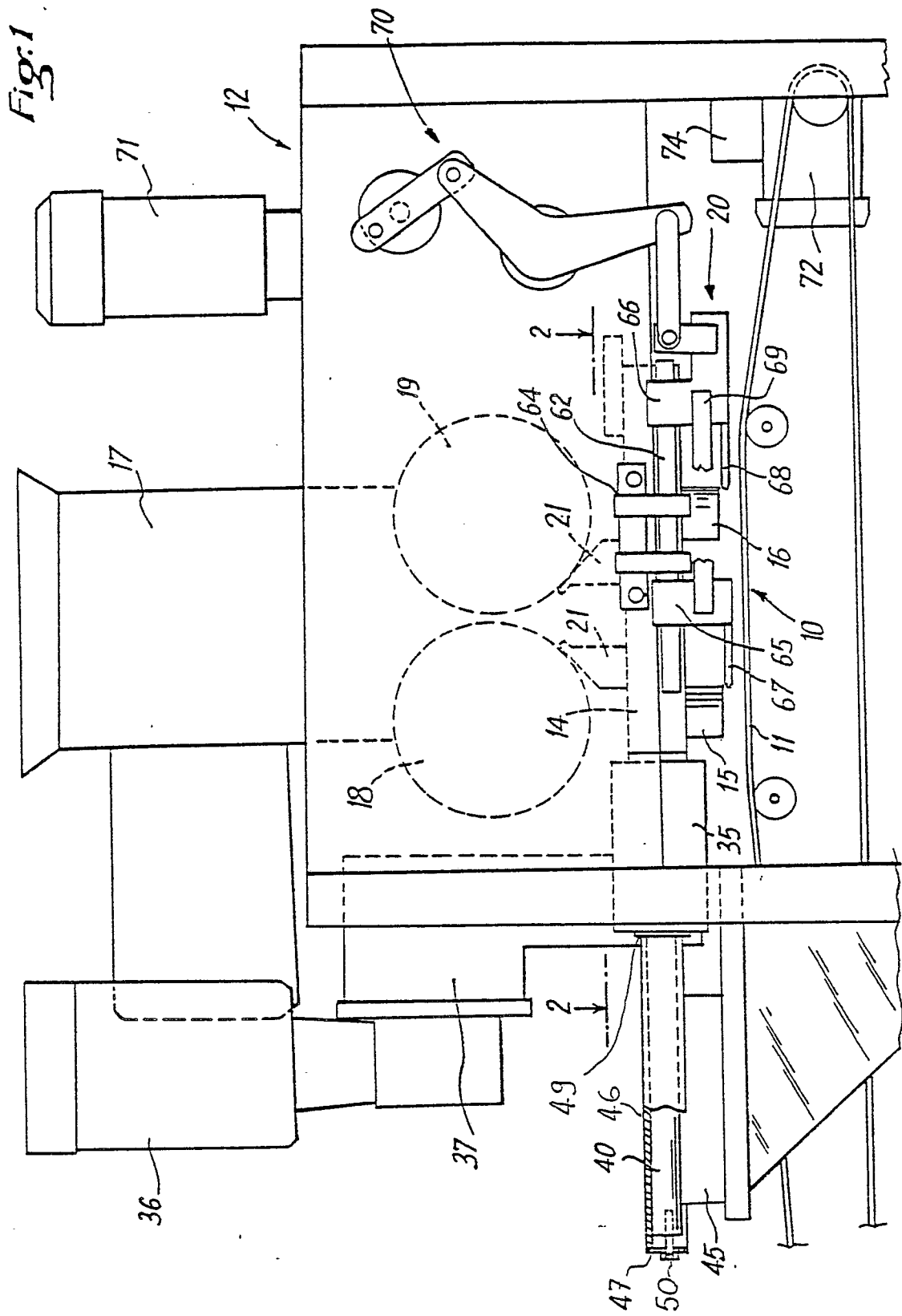


Fig. 2

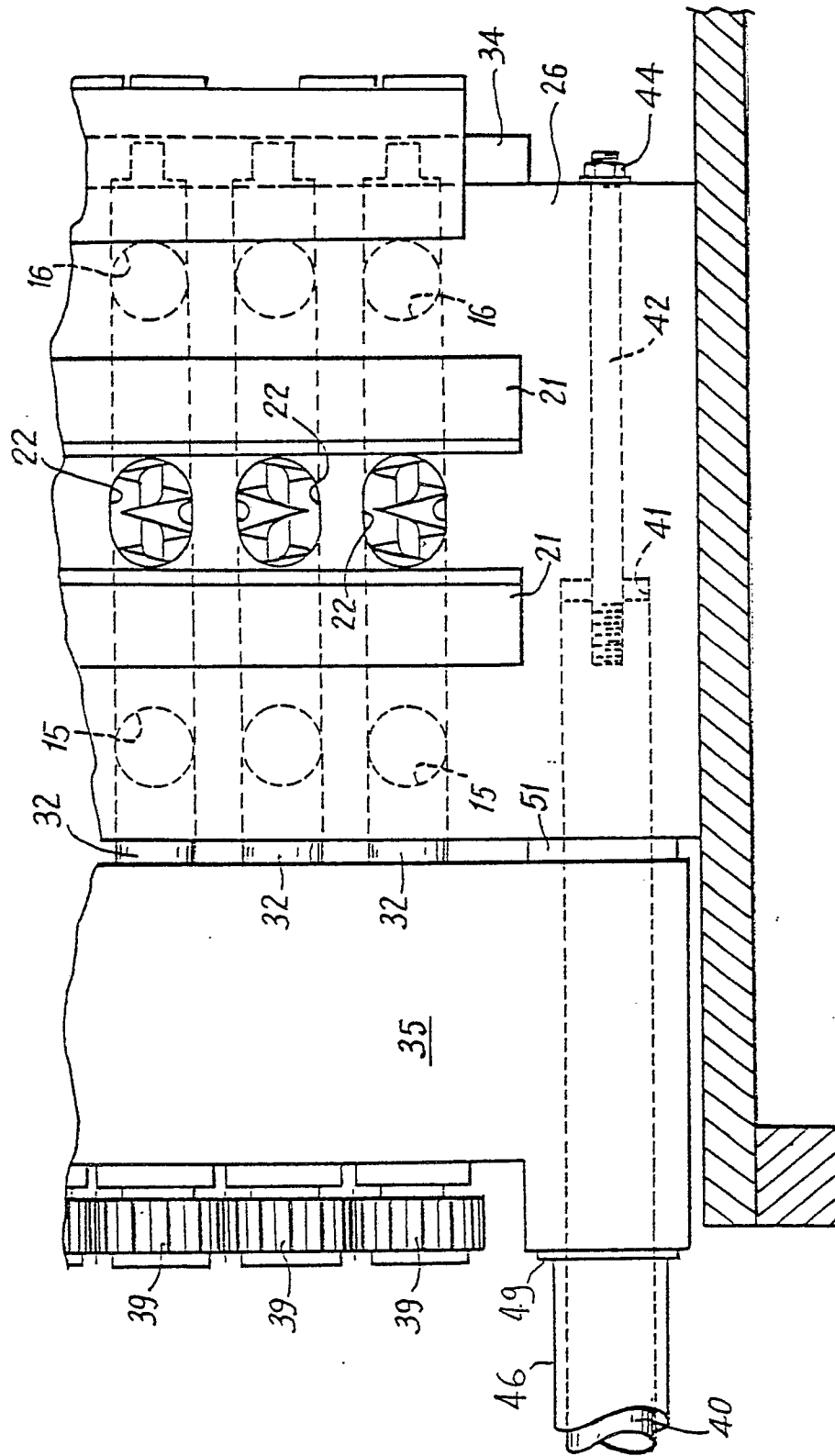


Fig. 3

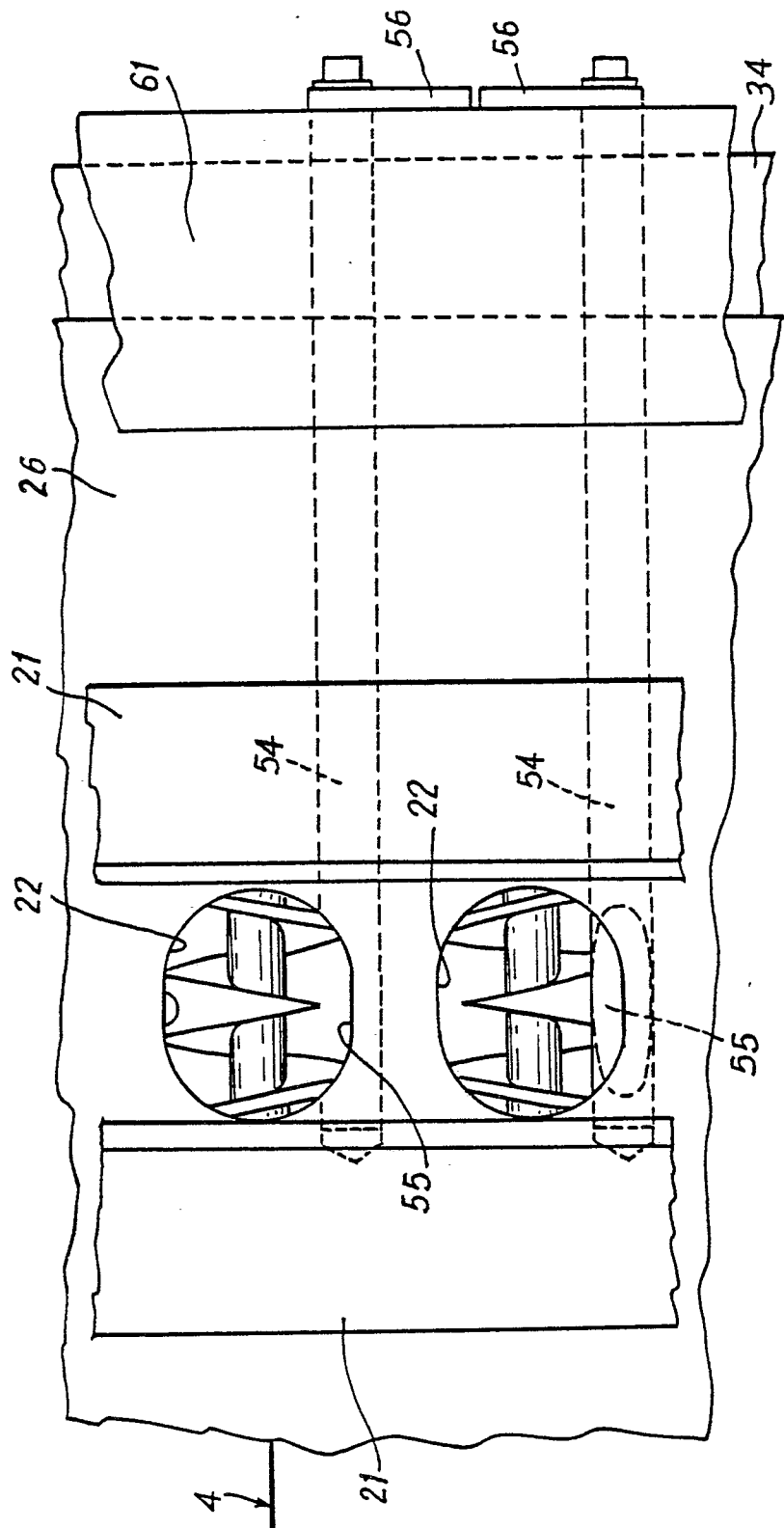


Fig. 4

